



ARIZONA DEPARTMENT OF TRANSPORTATION \* MATERIALS SECTION

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## POLICY AND PROCEDURE DIRECTIVE

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Assistant State Engineer

TO: ALL MANUAL HOLDERS	PPD NO. 92-2
SUBJECT:  SAMPLING, TESTING, AND ACCEPTANCE OF REINFORCING BARS	EFFECTIVE DATE:  July 1, 1992

### GENERAL

This Policy and Procedure Directive outlines the procedure to be followed for sampling, testing, and acceptance of reinforcing bars. It supersedes P.P.D. No. 86-2 and any other previous memorandums or bulletins issued on this subject.

### PROCEDURES

Samples of reinforcing steel bars taken at the suppliers or fabricators place of business shall be known as the pre-shipment samples, while those samples obtained from stockpile or shipment at the project shall be known as project samples. A shipment should be considered any amount of reinforcement steel bars delivered to a project on any given day, of one transported load.

### PRE-SHIPMENT SAMPLING FROM SUPPLIERS AND/OR FABRICATORS IN THE PHOENIX AREA

When a supplier or fabricator plans a shipment of reinforcing steel to an ADOT construction project, they should first contact Materials Testing Services to obtain a laboratory number referenced to the project number. Normally the following working day, Materials Testing Services personnel will randomly sample the pre-shipment or receive a pre-shipment sample from the supplier or fabricator at their place of business. For bar size #14, the sample shall be one piece forty-two (42) inches in length, selected at random for each shipment up to thirty (30) tons. For the bar size #18, a sample shall be one piece forty-two (42) inches in length, selected at random for each shipment up to fifty (50) tons. For all other bar sizes the sample shall be one piece, six (6) feet in length, selected at

random for each shipment up to twenty (20) tons and one sample for each twenty (20) tons thereafter. Those samples will be submitted for each bar size, grade, heat number, and manufacturer in the shipment. All samples shall be submitted to Materials Testing Services, with testing to commence shortly. The pre-shipment bars that are obtained from the supplier or fabricator must be accompanied by a complete and accurate original Certificate of Compliance. The information shown on the certificate must match the bar identification marks. If no original Certificate of Compliance is available or the information shown on the certificate is incomplete or inaccurate, the bars should not be accepted for testing. The manufacturer will not be required to submit a Certificate of Analysis (Mill Test Reports).

When the supplier or fabricator makes a shipment to a project, they will furnish a completed Certificate of Compliance (a blank sample is attached) stating that the material in the shipment is from the same stock as the pre-shipment sample covered by the Materials Testing Services laboratory number given to them earlier. If the pre-shipment sample fails to comply with specification requirements, Materials Testing Services will notify the project by telephone without delay at the completion of testing. In addition, the project shall verify the authenticity of the laboratory number and the reference to the testing of the pre-shipment sample bars, by contacting Materials Testing Services.

All shipments will be subject to spot sampling upon arrival at the project. The project sample shall consist of one sample bar six feet in length, regardless of number of bar sizes. This sample bar should be taken at random from each shipment to the project and submitted to Materials Testing Services for testing. The placement of the reinforcing steel bars into its designed position shall not be held up until the test results are received by the project. However, the concrete placement operation should not begin until satisfactory results of the project sample bar testing are obtained.

**PRE-SHIPMENT SAMPLING FROM SUPPLIERS AND/OR  
FABRICATORS IN THE TUCSON AREA**

Sampling procedures shall be similar to the requirements for the Phoenix area suppliers and/or fabricators, except as follows:

When the supplier or fabricator plans a shipment to an ADOT project, they should first call the District II Laboratory and indicate to which project the shipment is being sent, and request the issuance of a Materials Testing Services laboratory

number. The District II Laboratory personnel shall obtain on that same day a laboratory number and respond promptly to the supplier or fabricator with that number and inquire as to when the sample will be ready for pick-up. District II Laboratory personnel shall randomly sample the pre-shipment or receive a pre-shipment sample from the supplier or fabricator at their place of business. District II Laboratory personnel shall maintain a log that includes the Materials Testing Services laboratory number, the project number, bar sizes included in the shipment, the date on which the sample is to be received from the supplier or fabricator, a notation made when the sample is actually obtained. Pre-shipment sample bars should be transported to Materials Testing Services at the earliest possible opportunity.

#### **REINFORCING BARS NOT PRE-SHIPMENT SAMPLED**

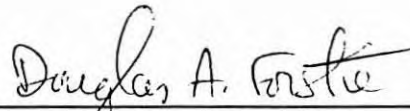
When the supplier or fabricator makes a shipment to a project from outside the Phoenix and Tucson areas and not otherwise subjected to pre-shipment sampling, the shipment shall be accompanied by a Certification of Compliance conforming to the requirements of subsection 106.05 of the Standard Specifications. Before any reinforcing steel from a shipment is to be incorporated into the project work, a project sample shall be taken, tested and approved. A project sample shall be taken as soon as practical upon arrival at the job site. A different project sample that is representative of each bar size, grade, heat number and manufacturer from that shipment will be required. Use the sampling requirements described for pre-shipment sampling for the Phoenix Area.

#### **EPOXY COATED REINFORCING BARS**

Epoxy coated reinforcing bars will be sampled and tested in the same manner as uncoated reinforcing bars with the following changes. The coating thickness and flexibility of epoxy coated reinforcing bars will be tested by Materials Testing Services. The supplier or fabricator will be required to furnish a certificate which properly identifies the batch and/or lot number, material, quantity of batch, date of manufacturer, name and address of the manufacturer, and a statement that the powdered epoxy resin is the same composition as the initial sample pre-qualified for use. A statement shall also be submitted regarding the fact that production bars and pre-qualification bars have been identically prepared and applied with epoxy powders.

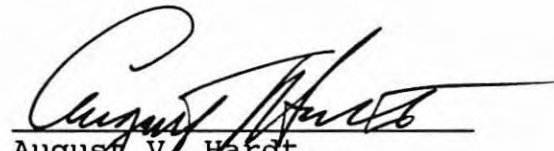
INFORMATION

Portions of the January 1990 Concrete Reinforcing Steel Institute "Manual of Standard Practice" for Concrete Reinforcement are reproduced, with permission, as attachments to this Policy and Procedure Directive. Included is a sheet giving the area, weight, and diameter of ASTM standard reinforcing bars; Material Specifications for reinforcing bars including the significance of bar markings; and, a listing of the U.S. manufacturers of reinforcing bars with their respective bar marks.



Douglas A. Forstie  
Assistant State Engineer  
Materials Section

Approved by:



August V. Hardt  
Deputy State Engineer  
Highway Operations Group

Attachments (10)



July 1, 1992

Attachment to P.P.D. No. 92-2

CERTIFICATE OF COMPLIANCE

PROJECT: \_\_\_\_\_

SUPPLIER: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

MATERIAL: \_\_\_\_\_

QUANTITY IN THIS SHIPMENT: \_\_\_\_\_

LOT NUMBER IDENTIFICATION: \_\_\_\_\_

APPLICABLE SPECIFICATION: \_\_\_\_\_

I certify that the material indicated above conforms to all requirements of the project specifications. It is from stock that has been sampled and issued laboratory number \_\_\_\_\_ by the Arizona Department of Transportation, Materials Testing Services.

\_\_\_\_\_  
Signature and Date

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

State of \_\_\_\_\_

County of \_\_\_\_\_

Sworn to before me this \_\_\_\_\_ day

of \_\_\_\_\_, 19\_\_\_\_.

SEAL

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
My commission expires

<b>ASTM STANDARD REINFORCING BARS</b>			
<b>BAR SIZE DESIGNATION</b>	<b>NOMINAL AREA SQ. INCHES</b>	<b>NOMINAL WEIGHT POUNDS PER FT.</b>	<b>NOMINAL DIAMETER INCHES</b>
<b># 3</b>	<b>0.11</b>	<b>0.376</b>	<b>0.375</b>
<b># 4</b>	<b>0.20</b>	<b>0.668</b>	<b>0.500</b>
<b># 5</b>	<b>0.31</b>	<b>1.043</b>	<b>0.625</b>
<b># 6</b>	<b>0.44</b>	<b>1.502</b>	<b>0.750</b>
<b># 7</b>	<b>0.60</b>	<b>2.044</b>	<b>0.875</b>
<b># 8</b>	<b>0.79</b>	<b>2.670</b>	<b>1.000</b>
<b># 9</b>	<b>1.00</b>	<b>3.400</b>	<b>1.128</b>
<b>#10</b>	<b>1.27</b>	<b>4.303</b>	<b>1.270</b>
<b>#11</b>	<b>1.56</b>	<b>5.313</b>	<b>1.410</b>
<b>#14</b>	<b>2.25</b>	<b>7.65</b>	<b>1.693</b>
<b>#18</b>	<b>4.00</b>	<b>13.60</b>	<b>2.257</b>

Current ASTM Specifications cover bar sizes #14 and #18  
in A615 Grades 60 and 75 and in A706 only.

## CHAPTER 1

MATERIAL SPECIFICATIONS FOR  
REINFORCING BARS

The specifications for reinforcement published by the American Society for Testing and Materials (ASTM) are generally accepted for construction in the United States. When ASTM revises specifications, most authorities usually accept the latest ASTM specifications even when local codes or independent specifications have not had corresponding revisions incorporated. This lag between changes and the special requirements of some public agencies causes occasional variations.

From the materials listed in this Chapter, or in Chapter 2, the structural engineer should select that grade and type of reinforcement which, in his or her judgment, will best meet the specific design requirements.

Chapters 1 and 2 cover material specifications for reinforcing materials. See Chapter 4 for suggested reinforcement specifications, and see Chapters 5 and 6 for recommended industry practices for estimating and detailing reinforcing materials.

## REINFORCING BARS

Specifications for billet-steel, rail-steel, axle-steel and low-alloy steel reinforcing bars are available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

The tables on page 1-2 summarize all pertinent mechanical, deformation, and chemical composition requirements for billet-, rail-, axle-, and low-alloy steel reinforcing bars. The first table also illustrates the grades and bar sizes available in accordance with the four ASTM specifications.

Rolling mill identification marks required by ASTM specifications are shown on page 1-3. The bar marks used by domestic mills known to be commercially producing rebars are illustrated in detail in Appendix A.

CRSI RECOMMENDATION –  
WELDING OF REINFORCING BARS

The "weldability" of steel established by its chemical analysis limits the applicable welding procedures and sets preheat requirements. Chemical analyses are not ordinarily meaningful for rail and axle bars. The chemical analysis (available upon request) for standard A 615 billet bars is incomplete for determining welding requirements under the "Structural Welding Code Reinforcing Steel" (AWS D1.4-79). Special complete analyses may be secured usually at an extra cost. It should be noted that all standard bar specifications, A 615, A 616, and A 617, specifically note that "The weldability of the steel is *not* part of this specification."

For these reasons, the CRSI recommendation for welding of reinforcing bars is:

"Reinforcing bars conforming to ASTM A 706, 'Low-Alloy Steel Deformed Bars for Concrete Reinforcement,' are recommended for use in all seismic-resistant reinforced concrete structures and wherever important or extensive welding is required. Before specifying A 706

reinforcement, however, local availability should be investigated. Most producers can make A 706 bars, but not in quantities less than one heat of steel for each bar size. (A heat of steel varies in different mills, but may be about 50 to 200 tons.) Thus, A 706 in lesser quantities of single bar sizes may not be immediately available from any single producer. Since the special qualities for seismic-resistant construction are required only for the flexural reinforcement in principal frame members, it will seldom be economical for a user to specify A 706 for small bars, #3, #4, #5, and #6, usually employed for shear or in thin slabs not part of the primary seismic-resistant frame, and which seldom require welding as they can be lap spliced."

## SPIRAL REINFORCEMENT

## 1. STANDARD SIZES

Plain round bars, deformed bars, or wire for spirals are furnished in the following standard sizes and areas as prescribed in the "Simplified Practice Recommendation—Steel Spirals for Reinforced Concrete Columns" in Appendix B. Areas and weights are in accordance with the following table:

## STANDARD SIZES

	Area (Sq. in.)	Weight (Lb. per ft.)
3/8" $\phi$ or #3 . . . . .	0.11	0.376
1/2" $\phi$ or #4 . . . . .	0.20	0.668
5/8" $\phi$ or #5 . . . . .	0.31	1.043

## 2. MATERIAL

Hot-rolled bars for spirals should conform to ASTM A 615, A 616, A 617, or to ASTM A 706, as specified.

Cold-drawn wire for spirals should conform to ASTM A 82 with a minimum yield strength of 70,000 psi.

Deformed wire for spirals should conform to ASTM A 496 with a minimum yield strength of 75,000 psi.

Unless otherwise specified, plain or deformed hot-rolled bars will be furnished.

## CHAPTER 1

# MATERIAL SPECIFICATIONS FOR REINFORCING BARS (Cont.)

## MECHANICAL REQUIREMENTS FOR STANDARD ASTM DEFORMED REINFORCING BARS

Type of Steel and ASTM Designation	Bar Nos. Range	Grade <sup>1</sup>	Minimum <sup>2</sup> Yield, psi	Minimum Tensile strength, psi	Minimum Percentage Elongation in 8 in.	Cold Bend test <sup>3</sup> Pin Diameter (d = nominal diameter of specimen)
Billet-Steel A 615	3-6	40	40,000	70,000	#3.....11 #4, #5, #6.....12	#3, #4, #5..... 3½d #6.....5d
	3-11, 14, 18	60	60,000	90,000	#3, #4, #5, #6.....9 #7, #8.....8 #9, #10, #11, #14, #18.....7	#3, #4, #5..... 3½d #6, #7, #8.....5d #9, #10, #11.....7d #14, #18 (90 deg).....9d
	11, 14 18	75	75,000	100,000	#11, #14, #18.....6	#11.....7d #14, #18 (90 deg).....9d
Rail-Steel A 616	3-11	50	50,000	80,000	#3, #7.....6 #4, #5, #6.....7 #8, #9, #10, #11.....5	For Grades 50 and 60: #3, #4, #5.....6d per S1 <sup>4</sup> ..... 3½d #6, #7, and #8.....6d per S1 <sup>4</sup> .....5d #9, #10.....8d per S1 <sup>4</sup> .....7d #11 (90 deg).....8d per S1 <sup>4</sup> .....7d
	3-11	60	60,000	90,000	#3, #4, #5, #6.....6 #7.....5 #8, #9, #10, #11.....4½	
Axle-Steel A 617	3-11	40	40,000	70,000	#3, #7.....11 #4, #5, #6.....12 #8.....10 #9.....9 #10.....8 #11.....7	#3, #4, #5..... 3½d #6 through #11.....5d
	3-11	60	60,000	90,000	#3, #4, #5, #6, #7.....8 #8, #9, #10, #11.....7	#3, #4, #5..... 3½d #6, #7, #8.....5d #9, #10, #11.....7d
Low-Alloy Steel A 706	3-11, 14, 18	60	60,000 <sup>5</sup>	80,000 <sup>6</sup>	#3, #4, #5, #6.....14 #7, #8, #9, #10, #11.....12 #14, #18.....10	#3, #4, #5.....3d #6, #7, #8.....4d #9, #10, #11.....6d #14, #18.....8d

<sup>1</sup> Minimum yield designation.<sup>2</sup> Yield point or yield strength. See ASTM specifications.<sup>3</sup> Test bends 180° unless noted otherwise.<sup>4</sup> Under supplementary requirements S1 of ASTM A 616 only. ACI 318 requires rail-steel bars (ASTM A 616) to meet Supplementary Requirement S1.<sup>5</sup> Maximum yield strength 78,000 psi (ASTM A 706 only).<sup>6</sup> Tensile strength shall not be less than 1.25 times the actual yield strength (ASTM A 706 only).DEFORMATION REQUIREMENTS FOR  
STANDARD ASTM DEFORMED REINFORCING BARS

Size No.	Maximum Average Spacing	Minimum Average Height	Maximum <sup>1</sup> Gap
3	0.262"	0.015"	0.143"
4	0.350"	0.020"	0.191"
5	0.437"	0.028"	0.239"
6	0.525"	0.038"	0.286"
7	0.612"	0.044"	0.334"
8	0.700"	0.050"	0.383"
9	0.790"	0.056"	0.431"
10	0.889"	0.064"	0.487"
11	0.987"	0.071"	0.540"
14	1.185"	0.085"	0.658"
18	1.58"	0.102"	0.864"

<sup>1</sup> Chord of 12.5% of nominal perimeter.

## CHEMICAL COMPOSITION REQUIREMENTS FOR STANDARD ASTM DEFORMED REINFORCING BARS

Type of Steel and ASTM Designation	Condition <sup>1</sup>	Element									
		Carbon (C)	Manganese (Mn)	Phosphorus (P)	Sulfur (S)	Silicon (Si)	Copper (Cu)	Nickel (Ni)	Chromium (Cr)	Molybdenum (Mo)	Vanadium (V)
Billet-Steel A 615	1	X	X	X	X						
	2			0.06%							
	3			0.075%							
Low-Alloy Steel A 706	1	X	X	X	X	X	X	X	X	X	X
	2	0.30%	1.50%	0.035%	0.045%	0.50%					
	3	0.33%	1.56%	0.043%	0.053%	0.55%					

<sup>1</sup> CONDITION DEFINITIONS: <sup>1</sup> Analysis required of these elements for each heat.<sup>2</sup> Maximum allowable chemical content for each heat.<sup>3</sup> Maximum allowable chemical content for finished bar.



## CHAPTER 1

# MATERIAL SPECIFICATIONS FOR REINFORCING BARS (Cont.)

## IDENTIFICATION MARKS\*—ASTM STANDARD REBARS

The ASTM specifications for billet-steel, rail-steel, axle-steel and low-alloy reinforcing bars (A 615, A 616, A 617 and A 706, respectively) require identification marks to be rolled into the surface of one side of the bar to denote the producer's mill designation, bar size, type of steel, and minimum yield designation. Grade 60 bars show these marks in the following order.

1st — Producing Mill (usually a letter)

2nd — Bar Size Number (#3 through #18)

3rd — Type of Steel: **S** for Billet (A 615)

**I** for Rail (A 616)

**I R** for Rail meeting Supplementary Requirements S1 (A 616)

**A** for Axle (A 617)

**W** for Low-Alloy (A 706)

4th — Minimum Yield Designation

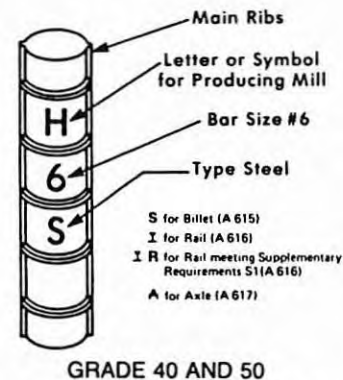
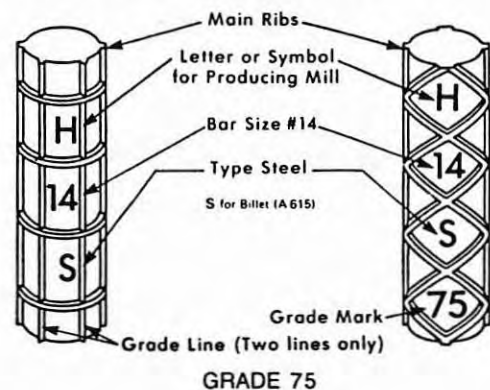
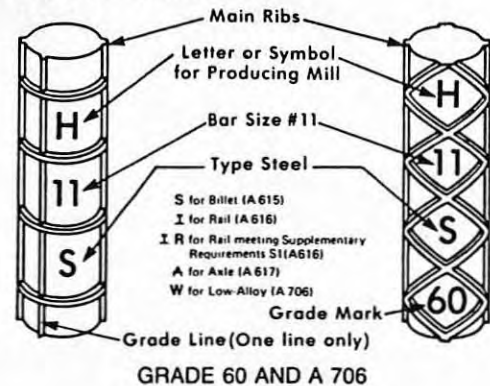
Minimum yield designation is used for Grade 60 and Grade 75 bars only. Grade 60 bars can either have one (1) single longitudinal line (grade line) or the number 60 (grade mark). Grade 75 bars can either have two (2) grade lines or the grade mark 75.

A grade line is smaller and is located between the two main ribs which are on opposite sides of all bars made in the United States. A grade line must be continued through at least 5 deformation spaces, and it may be placed on the side of the bar opposite the bar marks. A grade mark is the 4th mark on the bar.

Grade 40 and 50 bars are required to have only the first three identification marks (no minimum yield designation).

**VARIATIONS:** Bar identification marks may also be oriented to read horizontally (at 90° to those illustrated).

Grade mark numbers may be placed within separate consecutive deformation spaces to read vertically or horizontally.



## ACI BUILDING CODE – REQUIREMENTS FOR REINFORCING BARS

The current ACI Building Code requires billet-steel reinforcing to conform to the ASTM A 615 specification.

Rail-steel reinforcing bars must meet A 616 including supplementary requirement (S1). As shown in the mechanical requirements table on page 1-2, the supplementary requirement (S1) prescribes more-restrictive bend tests. S1 also requires that A 616 reinforcing bars fur-
















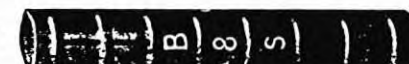
nished to these supplementary requirements must be designated for type of steel by the symbol "R", in addition to the rail symbol.

The ACI Code does not have special requirements for axle-steel (A 617) and low-alloy (A 706) reinforcing bars, nor take any exceptions to the ASTM specifications for these bars.

\*See Appendix A for complete identification marks of concrete reinforcing bars produced by all U.S. manufacturers. The marks, listed alphabetically by producing mill, include the identification requirements of ASTM and the deformation pattern used by each mill.


















## APPENDIX A

## U.S. MANUFACTURERS OF CONCRETE REINFORCING BARS

<b>IDENTIFICATION OF U.S. REINFORCING BARS</b> ASTM and AASHTO Specifications require that all reinforcing bars be identified by permanent, mill imprinted markings. See page 1-3.	
<b>1 A.B. STEEL MILL, INC.</b> <b>A</b>  #3 and #4 bars only Grade mark line used for #3	<b>5 BAYOU STEEL CORPORATION</b> <b>S</b>  Bars #4 through #6 only Grade mark line on opposite side
<b>1 A.B. STEEL MILL, INC.</b> <b>A</b>  Bars #5 through #10 only	<b>6 BIRMINGHAM STEEL CORPORATION</b> (Barbary Coast Steel Corporation) <b>S</b> 
<b>2 ARMCO INC.</b> (Midwestern Steel Division) <b>S</b>  #3 and #4 bars only Grade mark line on opposite side	<b>6 BIRMINGHAM STEEL CORPORATION</b> (Illinois Division) <b>S</b>  Bars #4 through #11 only
<b>3 ATLANTIC STEEL COMPANY</b> <b>S</b>  Coiled bars (#3 through #5 only)	<b>6 BIRMINGHAM STEEL CORPORATION</b> (Mississippi Steel Division) <b>S</b> 
<b>3 ATLANTIC STEEL COMPANY</b> <b>S</b>  Straight bars (#3 through #11 only)	<b>6 BIRMINGHAM STEEL CORPORATION</b> (Norfolk Steel Corporation) <b>S</b>  Bars #4 through #11 only
<b>3 ATLANTIC STEEL COMPANY</b> MILL BAR SIZES Cartersville ..... #3 through #7 only Atlanta ..... #8 through #11 only	<b>6 BIRMINGHAM STEEL CORPORATION</b> (Salmon Bay Steel Division) <b>S</b>  Bars #3 through #9 only
<b>4 AUBURN STEEL COMPANY, INC.</b> <b>S</b>  Bars #3 through #5 only	<b>6 BIRMINGHAM STEEL CORPORATION</b> (Salmon Bay Steel Division) <b>S</b>  Bars #10 through #18 only
<b>4 AUBURN STEEL COMPANY, INC.</b> <b>S</b>  Bars #6 through #11 only	<b>6 BIRMINGHAM STEEL CORPORATION</b> (Southern United Steel Division) <b>S</b>  Bars #5 through #11 only
	<b>7 BORDER STEEL MILLS, INC.</b> <b>S</b> 

## APPENDIX A (Cont.)








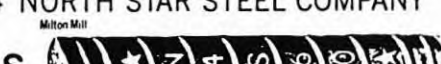
## U.S. MANUFACTURERS OF CONCRETE REINFORCING BARS

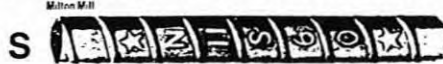



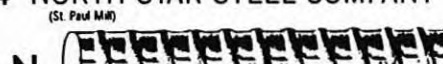
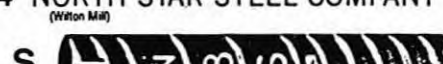


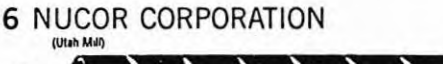
<p><b>IDENTIFICATION OF U.S. REINFORCING BARS</b></p> <p>ASTM and AASHTO Specifications require that all reinforcing bars be identified by permanent, mill imprinted markings. See page 1-3.</p>	<p><b>14 CONNECTICUT STEEL CORPORATION</b></p> <p><b>S</b> </p> <p>Bars #3 through #11 only Grade mark line on opposite side</p>
<p><b>8 CALUMET STEEL COMPANY</b></p> <p><b>S</b> </p> <p>Bars #4 through #10 only</p>	<p><b>15 FLORIDA STEEL CORPORATION</b> (Charlotte Steel Mill Division)</p> <p><b>S</b> </p> <p>Bars #4 through #11 only</p>
<p><b>9 CASCADE STEEL ROLLING MILLS, INC.</b></p> <p><b>S</b> </p>	<p><b>15 FLORIDA STEEL CORPORATION</b> (Jacksonville Steel Mill Division)</p> <p><b>S</b> </p> <p>Bars #3 through #11 only</p>
<p><b>10 CF&amp;I STEEL CORPORATION</b></p> <p><b>S</b> </p> <p>Bars #3 through #7 only</p>	<p><b>15 FLORIDA STEEL CORPORATION</b> (Knoxville Steel Mill Division)</p> <p><b>S</b> </p> <p>Bars #3 through #11 only</p>
<p><b>10 CF&amp;I STEEL CORPORATION</b></p> <p><b>S</b> </p> <p>#8 bar only</p>	<p><b>15 FLORIDA STEEL CORPORATION</b> (Tampa Steel Mill Division)</p> <p><b>S</b> </p> <p>Bars #4 through #11 only</p>
<p><b>10 CF&amp;I STEEL CORPORATION</b></p> <p><b>S</b> </p> <p>Bars #9 through #11 only</p>	<p><b>15 FLORIDA STEEL CORPORATION</b> (West Tennessee Steel Mill Division)</p> <p><b>S</b> </p> <p>Bars #4 through #18 only</p>
<p><b>11 CHAPARRAL STEEL COMPANY</b></p> <p><b>S</b> </p> <p>Grade mark line on opposite side</p>	<p><b>16 FRANKLIN STEEL COMPANY</b></p> <p><b>I</b> </p> <p>Bars #4 through #11 only</p>
<p><b>12 CHICAGO HEIGHTS STEEL</b></p> <p><b>I</b> </p> <p>Bars #4 through #8 only</p>	<p><b>17 GEORGETOWN STEEL CORPORATION</b></p> <p><b>N</b> </p> <p>Bars #3 through #5 only</p>
<p><b>13 COMMERCIAL STEEL CORPORATION</b></p> <p><b>I</b> </p> <p>Bars #3 through #6 only</p>	<p><b>18 HAWAIIAN WESTERN STEEL, LTD.</b></p> <p><b>S</b> </p>



## APPENDIX A (Cont.)

## U.S. MANUFACTURERS OF CONCRETE REINFORCING BARS


















<b>IDENTIFICATION OF U.S. REINFORCING BARS</b> ASTM and AASHTO Specifications require that all reinforcing bars be identified by permanent, mill imprinted markings. See page 1-3.	
19 INLAND STEEL COMPANY	
20 LACLEDE STEEL COMPANY	 Straight bars
20 LACLEDE STEEL COMPANY	 Bars #3 and #4 only, coiled bars
21 LTV STEEL COMPANY	 Bars #5 through #11 only
22 MARION STEEL COMPANY	 Bars #4 through #11 only
23 NEW JERSEY STEEL CORPORATION	 Bars #3 through #11 only
24 NORTH STAR STEEL COMPANY (Beaumont Mill)	 Bars #3 and #4 only
24 NORTH STAR STEEL COMPANY Milton Mill	 Bars #3 through #9 only

24 NORTH STAR STEEL COMPANY Milton Mill	 Bars #10 through #18 only
24 NORTH STAR STEEL COMPANY (Morroe Mill)	 Bars #4 through #18 only Grade mark line on opposite side
24 NORTH STAR STEEL COMPANY (St. Paul Mill)	 Bars #4 through #11 only Grade mark line on opposite side
24 NORTH STAR STEEL COMPANY (St. Paul Mill)	 #14 and #18 bars only Grade mark line on opposite side
24 NORTH STAR STEEL COMPANY (St. Paul Mill)	 Bars #6 through #18 (Patented)—Longitudinal groove on one side only Marking system not in conformance with ASTM Specifications
24 NORTH STAR STEEL COMPANY (Wilton Mill)	 Mill symbol "T" either appears as first mark (shown) or as last mark (under S)
25 NORTHWESTERN STEEL & WIRE CO.	 Bars #3 through #10 only
26 NUCOR CORPORATION (Nebraska Mill)	 Bars #4 through #11 only
26 NUCOR CORPORATION (Utah Mill)	 Bars #4 through #18 only



APPENDIX A (Cont.)

U.S. MANUFACTURERS OF CONCRETE REINFORCING BARS

<p><b>IDENTIFICATION OF U.S. REINFORCING BARS</b></p> <p>ASTM and AASHTO Specifications require that all reinforcing bars be identified by permanent, mill imprinted markings. See page 1-3.</p>	<p><b>32 SMI STEEL - ARKANSAS</b></p>  <p>Bars #3 through #11 only</p>
<p><b>27 OWEN ELECTRIC STEEL CO. OF S.C.</b></p>  <p>Bars #3 through #14 only</p>	<p><b>32 SMI STEEL - ARKANSAS</b></p>  <p>Bars #3 through #6 only</p>
<p><b>28 ROANOKE ELECTRIC STEEL CORP.</b></p>  <p>Bars #3 through #11 only</p>	<p><b>33 STRUCTURAL METALS, INC.</b></p>  <p>Bars #3 through #11 only</p>
<p><b>29 SEATTLE STEEL, INC.</b></p>  <p>Bars #3 through #11 only</p>	<p><b>33 STRUCTURAL METALS, INC.</b></p>  <p>#14 and #18 bars only</p>
<p><b>29 SEATTLE STEEL, INC.</b></p>  <p>#14 and #18 bars only</p>	<p><b>34 TAMCO</b></p>  <p>Bars #6 through #18 only</p>
<p><b>30 SHEFFIELD STEEL CORPORATION</b></p>  <p>Bars #3 through #14 only</p>	<p><b>34 TAMCO</b></p>  <p>Bars #4 and #5 only</p>
<p><b>31 SILVER, INC., W.</b></p>  <p>Bars #3 through #6 only</p>	<p><b>34 TAMCO</b></p>  <p>Bars #6 through #18 only</p>
<p><b>31 SILVER, INC., W.</b></p>  <p>Bars #3 through #6 only</p>	<p><b>35 THOMAS STEEL CORPORATION</b></p>  <p>Bars #3 through #6 only</p>
<p><b>31 SILVER, INC., W.</b></p>  <p>Bars #3 through #6 only Grade mark line on opposite side</p>	<p><b>36 USX CORPORATION</b></p>  <p>Bars #3 through #6 only</p>

## APPENDIX A (Cont.)

**U.S. MANUFACTURERS OF CONCRETE REINFORCING BARS**

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## NUMBERS REFER TO BAR MARK PHOTOS

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| 1. A.B. STEEL MILL, INC.<br>Cincinnati, Ohio                   | 19. INLAND STEEL COMPANY<br>Chicago, Illinois                    |
| 2. ARMCO, INC.<br>Kansas City, Missouri                        | 20. LACLEDE STEEL COMPANY<br>St. Louis, Missouri                 |
| 3. ATLANTIC STEEL COMPANY<br>Atlanta, Georgia                  | 21. LTV STEEL COMPANY<br>Cleveland, Ohio                         |
| 4. AUBURN STEEL COMPANY<br>Auburn, New York                    | 22. MARION STEEL COMPANY<br>Marion, Ohio                         |
| 5. BAYOU STEEL CORPORATION<br>La Place, Louisiana              | 23. NEW JERSEY STEEL CORPORATION<br>Sayreville, New Jersey       |
| 6. BIRMINGHAM STEEL CORPORATION<br>Birmingham, Alabama         | 24. NORTH STAR STEEL COMPANY<br>Minneapolis, Minnesota           |
| 7. BORDER STEEL MILLS, INC.<br>El Paso, Texas                  | 25. NORTHWESTERN STEEL & WIRE CO.<br>Sterling, Illinois          |
| 8. CALUMET STEEL COMPANY<br>Chicago Heights, Illinois          | 26. NUCOR STEEL CORPORATION<br>Norfolk, Nebraska                 |
| 9. CASCADE STEEL ROLLING MILLS, INC.<br>McMinnville, Oregon    | 27. OWEN ELECTRIC STEEL COMPANY OF S.C.<br>Cayce, South Carolina |
| 10. CF & I STEEL CORPORATION<br>Pueblo, Colorado               | 28. ROANOKE ELECTRIC STEEL CORP.<br>Roanoke, Virginia            |
| 11. CHAPARRAL STEEL COMPANY<br>Midlothian, Texas               | 29. SEATTLE STEEL, INC.<br>Seattle, Washington                   |
| 12. CHICAGO HEIGHTS STEEL<br>Chicago Heights, Illinois         | 30. SHEFFIELD STEEL CORPORATION<br>Sand Springs, Oklahoma        |
| 13. COMMERCIAL STEEL CORPORATION<br>Glassport, Pennsylvania    | 31. SILVER, INC., W.<br>El Paso, Texas                           |
| 14. CONNECTICUT STEEL CORPORATION<br>Wallingford, Connecticut  | 32. SMI STEEL—ARKANSAS<br>Magnolia, Arkansas                     |
| 15. FLORIDA STEEL CORPORATION<br>Tampa, Florida                | 33. STRUCTURAL METALS, INC.<br>Seguin, Texas                     |
| 16. FRANKLIN STEEL COMPANY<br>Franklin, Pennsylvania           | 34. TAMCO<br>Etiwanda, California                                |
| 17. GEORGETOWN STEEL CORPORATION<br>Georgetown, South Carolina | 35. THOMAS STEEL CORPORATION<br>Lemont, Illinois                 |
| 18. HAWAIIAN WESTERN STEEL, LTD.<br>Ewa Beach, Hawaii          | 36. USX CORPORATION<br>Pittsburgh, Pennsylvania                  |